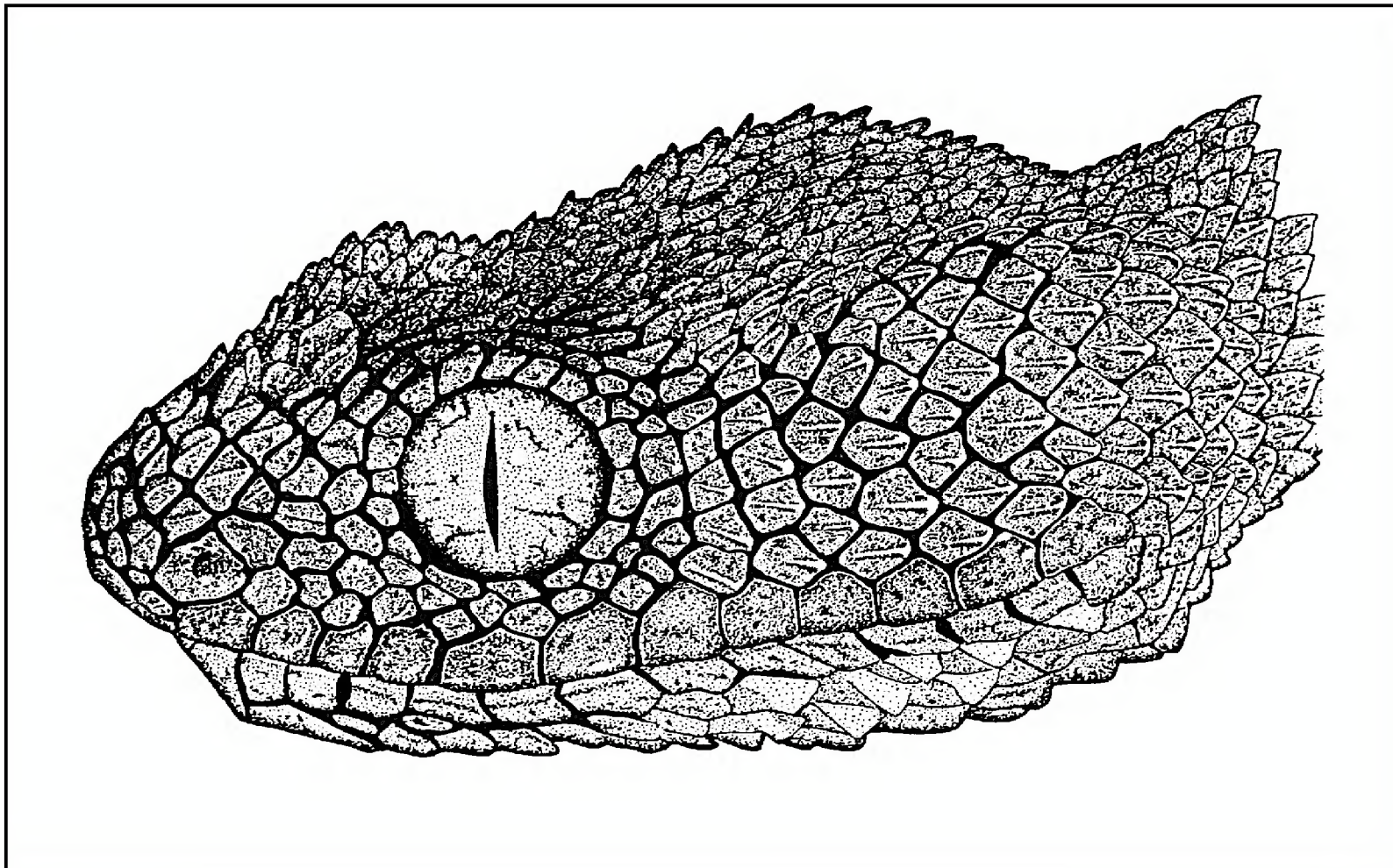

BULLETIN

of the

Chicago Herpetological Society



Volume 42, Number 4
April 2007



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

Volume 42, Number 4

April 2007

Frogs a Century Ago.	Ray Novotny	57
Extreme Feeding Methods for Snakes from Australia.. . . .	Raymond Hoser	62
Erratum: de Souza, R. C. G., Reproduction of the Atlantic Bushmaster (<i>Lachesis muta rhombeata</i>) for the First Time in Captivity.. . . .	Rodrigo C. G. de Souza	66
The Tympanum.	Ellin Beltz	66
What You Missed at the March CHS Meeting.. . . .	John Archer	67
Herpetology 2007.. . . .		69
Unofficial Minutes of the CHS Board Meeting, March 16, 2007.		71
Advertisements.		72

Cover: Western bush viper, *Atheris chlorechis*. Drawing by R. Michael Burger.

STAFF

Editor: Michael A. Dloogatch — madadder0@aol.com
Advertising Manager: Ralph Shepstone

2007 CHS Board of Directors

Linda Malawy, President
Steve Sullivan, Vice-President
Andy Malawy, Treasurer
Kira Geselowitz, Recording Secretary
Cindy Rampacek, Corresponding Secretary
Erik Williams, Publications Secretary
Mike Dloogatch, Membership Secretary
Jason Hood, Sergeant-at-Arms
Josh Chernoff, Member-at-Large
Deb Krohn, Member-at-Large
Jenny Vollman, Member-at-Large
Rich Crowley, Immediate Past President

The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, on IBM PC-compatible or Macintosh format diskettes. Alternatively, manuscripts may be submitted in duplicate, typewritten and double spaced. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2430 N. Cannon Drive, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for \$2.50 per issue postpaid. **Visit the CHS home page at** < <http://www.Chicagoherp.org> > .

The Bulletin of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society, 2430 N. Cannon Drive, Chicago IL 60614. Periodicals postage paid at Chicago IL. **Postmaster:** Send address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago IL 60614.

Frogs a Century Ago

Ray Novotny
Ford Nature Center
Mill Creek MetroParks
840 Old Furnace Road
Youngstown, OH 44511
raynovotny@yahoo.com

I like frogs. Many of you do, too. One of my favorite books about them is simply titled *The Frog Book* by Mary C. Dickerson.

I noticed long ago that Ms. Dickerson finished her book on June 10, 1906, almost exactly three weeks after my dear grandmother was born. I'd planned to note this connection by publishing this piece during my grandmother's centennial year, but, like many of you, I got behind. Grandma, please forgive me.

The Frog Book has aged remarkably well. Being curious about its original reception, I dug into the microfilm, and thought I'd share my finding with you.

New York Times
September 1, 1906

Some Nature Books of the Middle Season for Observers and Experimenters

Written for the New York Times Saturday Review of Books by
Mabel Osgood Wright

All About Frogs

One of the signs of the times through which intelligent interest in nature, surpassing the merely taking and the superficial, may be read, is the excellence of popular books upon all branches of natural history. Not so very long ago perfect accuracy and personal investigation were not necessarily demanded on the part of authors of such books; if they told an interesting story pleasantly it was sufficient. But all that is changed and the new order of things demands unquestioned scientific accuracy and its expression in language intelligible to any one capable of reading English. From this standpoint Miss Dickerson fairly meets the requirements; moreover, she gives the fruit of much study and personal investigation with a light, though none less sure, literary touch that renders vital and interesting what might otherwise be rather an abstract subject for hoi polloi.

Most of us know a frog from a toad when we see them and associate the one with ponds and the other with garden walks or as immovable squatters in the loose sand by our cellar ways. Many of us know that some of the first notes of Spring music, breaking the early March silence almost before the bluebird and song sparrow have found voice, are the piping of the little hylas down among the matted marsh reeds. All of us who have enjoyed any satisfactory sort of childhood have watched the legless tadpoles with a long tail gradually develop into a four-footed amphibian with no tail whatever — but this is the limit of general frog information.

However, the batrachians, to which the entire frog tribe, as well as salamanders, belong, are an exceedingly interesting class of vertebrates, occupying a position on the evolutionary ladder between fishes and reptiles. In fact, in youth the frog and toad have many fish attributes, though in later life they diverge, having paired limbs furnished with fingers and toes, and as a class breathing through lungs after the gill-breathing period of tadpole life has passed. The development of the fishlike tadpole into the four-footed frog is a familiar example that will illustrate the possibilities of the gradual evolution of types in the great plan of creation.

When the covers of "The Frog Book" have opened wide before you, a new realm of earth, water, and trees will appear for the life histories of these creatures, and their periods of development are but another volume of the true fairy tale that Mother Nature is ever telling, now that the ever eager human ear is keyed to hear her language.

Aside from their life habits and the part they play through them in the economy of nature, the voice of the frog is to be reckoned with in the symphony of natural music. Many and many a time has the rower upon a lake gone ashore in order to locate some unknown bird, as he thought, whose alarm note has sounded behind him from the underbrush, only to find the call note still behind in the rushes of shallow water, where it came from a swelling batrachian's throat. This "Frog Book" is as much a necessity to the dweller out of doors who wishes to know his wild friends by name as Chapman's "Manual of Birds of Eastern North America" and Gray's comfortable (if somewhat out of date) pocket "Manual of Botany. . . ."

Mary Dickerson was a curator at the American Museum of Natural History in New York City. According to Dr. Charles Myers (2000) she was both distinguished and driven. Unfortunately, her life ended tragically. I thank him for his intriguing work, highly recommend it, and am especially grateful to him for providing a bibliography of her publications. These publications include "The Pageant of Nature," ten articles that appeared in the magazine *Country Life in America* in 1907, the year following her *Frog Book*. Like the review above, these articles are probably now forgotten. Many of us will enjoy listening to and looking for frogs this spring, so in homage to "Miss Dickerson" I've chosen one to reprint — one that appeared 100 years ago this month: "The Watercourses of April."

Special thanks go to two Mikes: Mike Krakora of En-Ser Reprographics for his help with scanning, and to Mike Dloogatch for his patience.

References

- Myers, C. W. 2000. A history of herpetology at the American Museum of Natural History. Bulletin of the American Museum of Natural History. Number 252.



Late-April chewinks and brown thrashers join the robins in the woodlot and make the place seem spring-like



When the pussy willow has a halo of yellow stamens, the eggs of the American toad are laid in the pond



Just any spot in the early April woods. The false hellebore unfolds and spreads its plaited leaves

THE PAGEANT OF NATURE

III. The Watercourses of April

By MARY C. DICKERSON

Photographs by the author

HILLS and sky are half concealed in fine rain, and from strips of melting snow along the border of the woods white vapor rises and spreads, a mist to meet the mist. There is a distant muffled drumming of the grouse. Yonder a gray squirrel scampers to the topmost branches of an elm, bites off a twig and rapidly eats the opening flower buds. Here song sparrows in pairs hop on the ground, the female in advance, or chase with marvelous swiftness and seriousness, circling back and forth across the meadow, over the brook and through maze after maze of wet branches.

At last the gray lightens. As the clouds scatter and race over the sun, various bits of the landscape, suddenly illumined and as quickly darkened, flash a moment on the view. Low mist-covered second-growths of red maple make an expanse of glowing rose color, and a tall beech in their midst seems to radiate light. A meadow of dry grass is rich yellow; a plowed field shows furrows of shining brown; now a distant hill is lifted from obscurity; now a curve of the river mirrors trees and sky.

In the meadow the woodchuck comes out for his afternoon meal of young grass; and along the roadside the chipmunks feel the same warmth and sunshine that they left when they went to sleep in the fall. Flocks of geese steer north, and ducks are in the river. Crows fly in pairs. The marsh hawk hovers over meadows. The bluebird is bringing his mate delicate young locusts from the grass although she is not yet sitting on the eggs; and toward dusk the woodcock begins his aerial test of wing and breath.

However, if one judges of the spring through his ears, April's greatest activity is among creatures more lowly than birds or mammals and the water courses are the centres of this activity.

Listen! What is the strange monotone of sound? It is unusually musical. Push through the alders to the pond. Now the sound has stopped. The clear water reveals red feathery tops of water-weeds veiled in floating green and gives

reflections of naked alder branches and the massed red of maple flowers. All reflections are continually zigzagged into new patterns by waves—rapidly progressing acute angles of motion made by scores of "lucky bugs," widening concentric circles where a pickerel thrusts his head up from below, or curving lines that sweep before the wind over the pond's whole length and breadth.

Distinct paths lead into and through the shallow water, narrow paths and broader ones, where the leaves of the bottom and the floating green have been swept aside and combed into line by some moving object. Here are the makers of the narrow paths. Two male spotted turtles are fighting where the water is shallow. With lifted heads and arched necks they strike vigorously and chase round and round, each trying to get at the head of the other. One often gets the other by the leg but cannot maintain his hold; or he gets a firm grasp of the shell above the other's retreated head but almost immediately sharp mandibles bite him in the neck below.

There is a rocking of the deeper water beyond and up comes some huge brown object under the button-bushes. It



The fox sparrow is cheery and confiding. He scratches with both feet at once, giving a forward and backward jump, the toes held rigid and close to the ground in the backward movement. Song sparrows (the third view) are much wilder birds



The chipmunk hibernates rolled into a ball



When he awakens, a breath moves the sides, the body begins to relax



The woodchuck wakes from hibernation in late March or early April



When he sees an enemy he turns toward his burrow



If he is near the stone wall he may proceed deliberately, with head lowered

is a muskrat, and the broad paths must be his. He lies on the surface like a piece of wood, his wet fur sleeked back in lines. Only his bright eyes and moving whiskers show that he is alive.

Now a toad sits in the shallow water under the button-bush, having risen from beneath the green of the pond bottom. Suddenly he puffs out his throat into a round pouch and trills the call we listen for, a wonderful sound—tremulous, sweet, simple, like the new life of the spring.

The muskrat slowly, stealthily reaches out his head through the short space that separates him from the toad; but the eager singing fellow does not see. Now, with prey between his teeth, the muskrat points his lifted head straight downward, arches his back and dives.

The sun is low in the west. Redwings are talking noisily. Tree swallows fly over the pond from which the vivacious calls of Pickering's hyla begin to issue; and now other toads appear and puff out their throats in the shallow water at the margin of the pond.

It is a surprise to find our garden toad in these surroundings; and to see him sing is amusing, for he inflates a large throat pouch and fairly shakes with eagerness as the air passes back and forth over the vocal cords, between this resonating pouch and the lungs. To see him sing is amusing; the sound of his singing lifts the humble fellow to a new plane. The call of the American toad is to the water-ways of April what the song of the bluebird is to the land. It is never exclamatory. It is not insistent, though continual. A chorus seems as if made by one toad, so perfectly do the calls blend. The voice seems to have no fixed location, but steals upon the air like a natural sound of the waking earth.

All winter the toad has been in some underground burrow of his own digging, where the lowered temperature put him to sleep in the fall. With legs folded under him and head bent downward, he has remained without motion, or breathing movements, cold—even frozen stiff perhaps. Yet some vital centre remained unfrozen, for he has come to life and alertness again now that warmth is here. In April, after the hazel's dead-looking twigs are strung with the crimson stars of the future nuts, and with drooping golden catkins, the toad begins to palpitate his throat. He makes his way to the surface of the ground and journeys eagerly in the direction of the greatest moisture until he finds shallow sun-warmed water.

The wood frog is earlier than the American toad in proclaiming spring from the ponds. At night it is too dark to see the frogs themselves, but not to see everywhere crossing the pond the advancing sharp angles of lighter water and the curves of motion behind as the frogs swim rapidly this way and that. And what exclamations and exultations! A few begin with vigorous croaks and others join till there is a tumult of unmusical sounds.

If the cold is not too severe wood frog eggs develop rapidly. If they are laid April 7th, black young tadpoles may be wiggling in the jelly spheres by April 14th, and by the 20th may be clinging—heads up, tails down—in circles on the outside of the jelly masses. From now on till their metamorphosis in May or June they are only larger and larger filmy-tailed "pollywogs" that nibble at the pond scums and regulate their movements according to the demands, not only of appetite, but also of temperature and enemies. During the forenoon their black wiggling forms keep near the surface, where the water is warm; from noon until late afternoon there is not a tadpole to be seen, for they have migrated to the cooler deeper water. Before dusk they again make the surface black; but are gone again by early morning, having sought the deeper water for warmth when the night air chilled the surface. So up and down they go, tiny automatons under the force of heat and cold.



During the days following their first waking, toads sing both day and night



The mouth is kept closed and the air passes from the lungs into the pouch through slits at the sides of the tongue



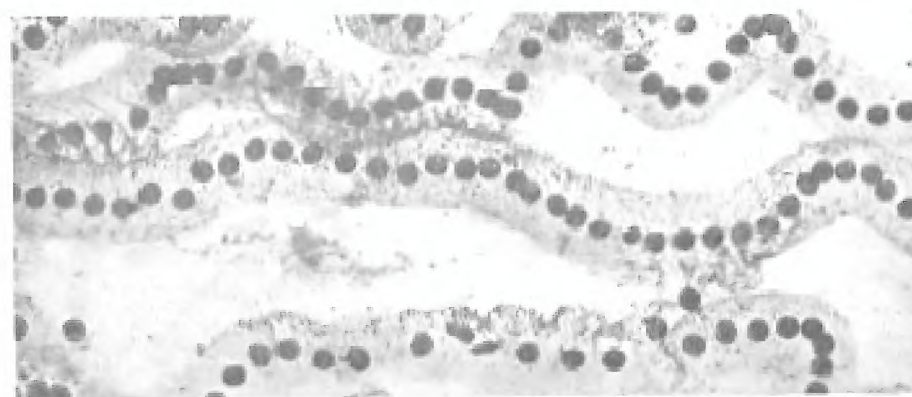
He is a picture of animation as he paddles about in the water and sings



He sometimes sings out of water. It is great physical joy to live—to feel the warmth and the water



The wood frog's eggs may be frozen in the water of the pond and yet continue development when the right temperature prevails—so tenacious and adaptive is life in these cold-blooded animals.



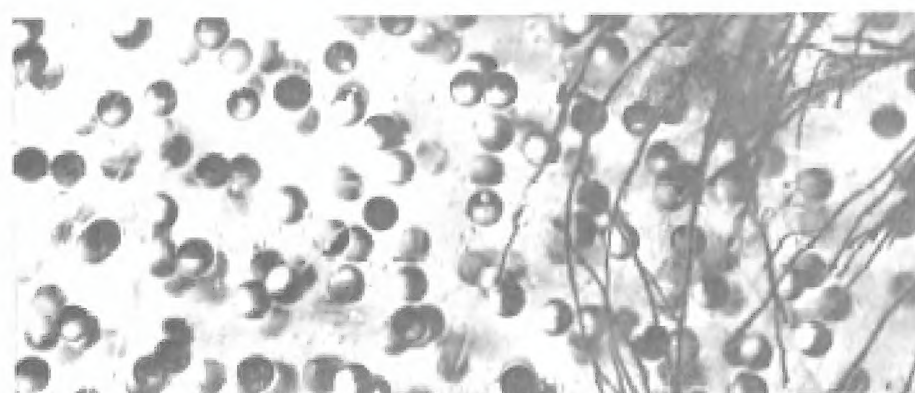
The eggs of the American toad are laid when the flowers of the red maple are falling (staminate) and the pussy willow is fragrant with yellow or green catkins.

They fall in legions before their many enemies, understanding little except to flee when directly pursued. From the water-weeds near the surface they drop to the bottom in a terrible fright as the "lucky bugs" skate along or the water strider goes skipping over them. But, on the other hand, the curved bodies of young water-tigers hang in their midst, with tadpoles dangling from sucking jaws, and there is nothing fearsome in the sight. Soon the jaws are outstretched for more and the tadpoles are always there.

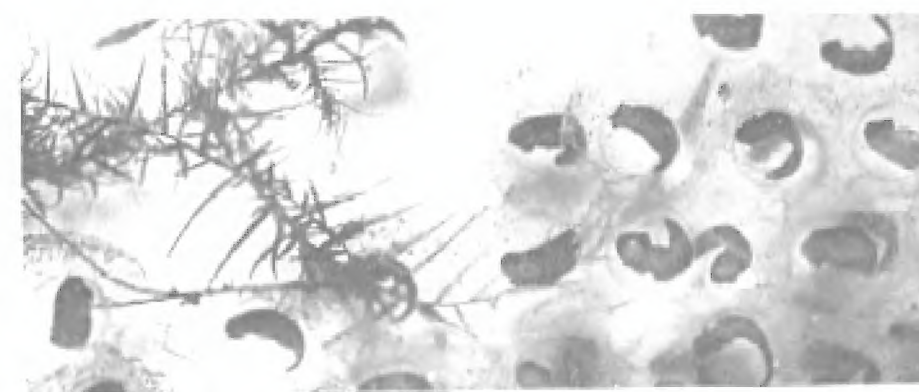
By the last of the month wood frog tadpoles are wearing coats of shining bronze and certainly seem numberless. Watch them in the deeper water, huddled close together and headed the same way like a school of fishes. The forward motion of the mass is slow but perceptible. No tadpole

However, some near relatives of the American toad are active but silent. The clear water of a pond on an early April morning may show a hundred or more large masses of eggs laid in the night by weird-looking creatures who may be in the pond now. Here is a nest of them far down in the sediment at the bottom where the water is deepest. They are long black salamanders set with yellow spots. When disturbed, they swim rapidly and gracefully to bury themselves again deep in the sediment.

American newts are active in the ponds in late April and in May. They swim over the bottom or climb among the water-weeds and smell out the small mollusks they feed upon. The one-year-old newts are usually red in color. They are sometimes found in the pond but more often under moss and



April 7th. The eggs of the wood frog are crowded together in masses. The lower two thirds of the egg shows the white yolk.



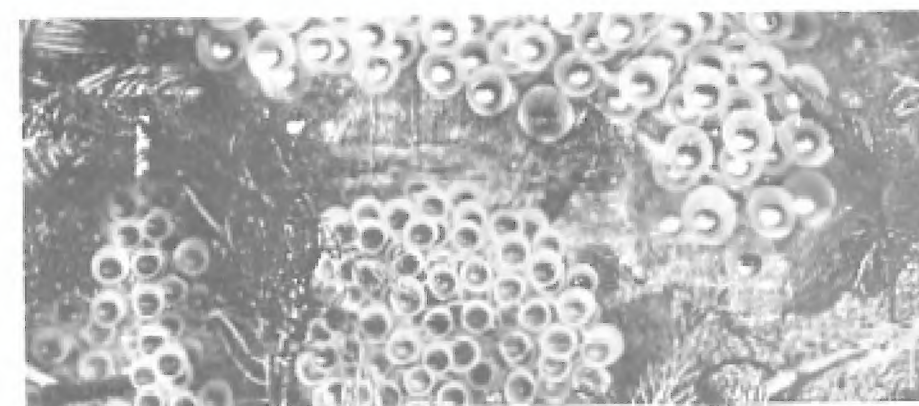
April 14th. The young black tadpoles move in the jelly-spheres and will soon hatch.

breaks rank or turns to right or left, except as an occasional one dashes to the surface to breathe. For long afternoon hours the mass keeps together, progressing, turning, slightly changing shape, but maintaining unity. When a painted turtle tumbles among them from a stone above, they instantly drop to the bottom, spread and break ranks, only to draw together in a different place and continue their slow maneuvering.

The most conspicuous, most continuous sound of April is probably the call of Pickering's hyla. His voice which ushered in the spring in February and March has now increased in power so that a chorus near at hand is almost ear-splitting.



Weird looking creatures! Spotted salamanders are active at night only, and during the day sleep under logs and stones.



The eggs below have been laid but a few hours; those above have been in the water longer, though the jelly spheres are still relatively small.



Toads "play dead," hugging feet to the body and stopping the breathing movements of the throat. After a few seconds they ludicrously relax their position and "come to."

them forward again and again. The skin works backward over the body easily by muscular contractions and the hind legs are removed as were the front ones. At last the skin lies in a wrinkled mass around the thick part of the tail. What an absorbed, alert look is in the little creature's face as he turns his head and, after viewing the situation, reaches back, takes hold of the skin with his mouth and jerks it off triumphantly! Of course, he proceeds to swallow it, following the custom of his ancestors for ages.

After the eggs are deposited, the adult batrachians have no connection with their history. They put them in stagnant water and some species are as likely to choose a shallow pool that will be dry a week later as a permanent pond. Year after year American toads resort to pools in country lanes and meadows to lay their eggs, when within a week there will be only whitish stains on the mud to show where the innumerable hundreds of eggs perished. Year after year thousands of wood frog tadpoles are huddled together in drying pools and soon blackened stains surrounded by foot-prints of woodcock and spotted sandpiper, muskrat and skunk tell the story of the tremendous loss of life.

Batrachians are representatives of a very



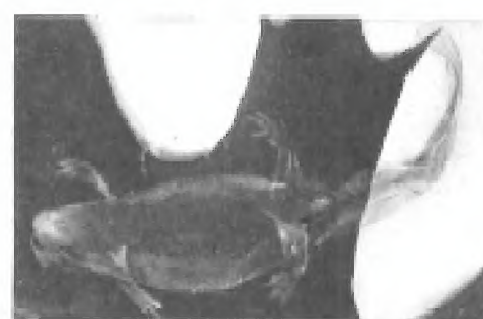
This wee tree frog is Pickering's hyla, the "Spring Peeper"



The male American newt has an extra ruffling of the tail fin in April



They pose in ludicrous erect positions in the water (female above)



Here floats the ghost of a newt—its empty molted skin



Fowler's toad comes from hibernation two or more weeks later than does the American toad. His voice is one of the most insistent sounds in May

old race, older than reptile, bird, or mammal. When their primitive songs ring from the water courses, as in ages gone by, they announce the height of the year's activity of this race. They proclaim enjoyment of the warmth and the water, of the abundance of food and of their fellows.

Early April is hopeful, not eager. By the last of April there is a fulness of life that is a promise of the later spring. The willows are beginning to sheathe their yellow stems with green. In the lowlands, marsh marigolds are reflected in every pool and spring; and although some of the red maples have lost their color, others have gained a deeper red (pistillate).

At night the sky is gray and, but a few stars are shining. The elms by the roadside spread wide black tops. The meadow brook is a gleaming ribbon of light, while along its margins shine the occasional fires of glowworms in the grass. The ringing chorus of Pickering's hyla rises from the marsh; the woodcock is swinging through the air above his mate. It is impossible to determine the direction of the fluttering notes of the toad. The song is all-pervading, a serene sound of the night which might come from the earth, or the tree tops, or the clouds low in the sky.



In late April false hellebore fairly conceals the brook it borders



Late April—bare trees, but a blue river and a blue sky and new growths of river grass



Marsh marigolds crowd their faces to the sun and are reflected in every pool and spring

Extreme Feeding Methods for Snakes from Australia

Raymond Hoser
488 Park Road
Park Orchards, Victoria, 3114
AUSTRALIA
adder@smuggled.com

Abstract

Experiments in the period 2002–2006 with various food types showed that Australian elapid snakes and Australian pythons are capable of feeding on a far greater variety of food types than the literature or previous anecdotal reports have indicated. Experiments with totally unnatural food items showed that in captive situations, non-natural food types sometimes have distinct advantages over the snake's usual diet in terms of ease for the owner to source and sometimes even in terms of nutritional benefit for the snakes. As a result of this study, the repertoire of feeding methods for keeping elapids (also pythons and no doubt other snakes as well) is greatly increased. Potential foodstuffs include: lizards, rodents and other mammals, fish (most types), amphibians, birds, and parts of all the preceding, including (although not necessarily recommended) filleted fish, meat pieces (of most types), bones, meatballs, sausages, stir fry, whole steaks and even prawns and calamari.

Introduction, Materials and Methods

It's sometimes said that necessity often breeds the most radical or useful innovations. Within the bounds of Australian snake keeping, nearly all species are thought to live exclusively on vertebrates. The exceptions are the typhlopids, which generally live on ants. Some of the small fossorial species (e.g., *Simoselaps*), that are rarely kept by hobbyists are known to eat reptile eggs in the wild when they are available, but in line with most other small elapid snakes, they also feed on small lizards, which appear to dominate the dietary intake.

Hence, until now the foods used by keepers for their snakes have generally been small skinks for small and neonate snakes, graduating to rodents for the larger snakes. In some states, due to legal restrictions, small lizards cannot be used as food. Thus there's been a strong shift away from species of snakes that require such food for any or part of their life cycle.

Exceptions to all this have been generally for large snakes, which may be fed birds, rabbits and other large items. For medium sized (usually about 1 m) snakes, day-old chicks from hatcheries are also used as food when rodents are unavailable, but are not regarded as being as good a food source, due to their lower nutritional value per body weight (or per feeding).

The use of day-old chicks is less now than in the 1980s, as the hatcheries that used to offload surplus males for free are now able to sell them to zoos and wildlife parks as food for birds of prey and hence there is no longer an unmet demand. Chicks are now similar in price to rodents, so snake keepers have tended to stick to the rodents because of their higher food value.

Some keepers experimented with fish some years ago and published their results — most notably, Brian Barnett and later Simon Kortlang (Barnett, 1981; Kortlang, 2001) and also myself (Hoser, 2004).

However in the case of the first two above-named keepers, their experiments were limited to live fish and only to see if

snakes would eat them. They did not rely on fish as a major part of their snakes' diets. Before and after those two papers were published, there was little use of fish for food by keepers until 2002–3 when I started using dead and frozen fish as a primary food source for the purposes of raising young death adders and later other species of snakes.

My findings were that almost all Australian snakes can in fact be fed fish of almost any species (fresh- or saltwater) and kept indefinitely on them (Hoser, 2004). Obviously, species known to be poisonous or which have spines should be excluded. However in terms of the latter, chopping off the spines may be possible in some cases and if this is done, then those fish can be fed to snakes in the usual way.

Catching fish in local ponds is easy using so-called "bait traps" as sold in most fishing shops. And they can even more easily be bought by the kilo in fish markets. One kilo of "whitebait" (*Galaxias* spp.) a smallish sized fish, is enough to raise a about four litters of a dozen snakes from say 15 cm to triple that length, whereupon they can then be switched to large mice. A kilo of whitebait in Australia is about \$10, (five pounds or five euros), which makes them a far better buy than any rodents.

Small eels (elvers) are another useful food alternative for snakes in Australia, but they tend to come on the market only sporadically. This is because they generally come from Tasmania and their use outside the herpetological market is limited. As bait they are regarded as an inferior to the more commonly available (and cheaper) whitebait.

Excessive use of fish as a diet for snakes is known to lead to a thiamine deficiency, but this can be averted by wiping Vegemite yeast extract on the fish before they are fed to the snakes. The snakes don't seem to mind the taste of Vegemite, which is amazing, as I can't stand the stuff (humans put it on slices of bread). It is sold in shops here in Australia; the equivalent in the USA and UK is called Marmite.

Another safeguard I use when raising snakes on fish is to

alternate with other food items occasionally (say every third or fourth feeding).

Typical alternatives are rodent limbs (to shoulder or hip) or tails culled from adult rodents that are to be fed to larger snakes. The larger snakes are quite happy to eat rodents minus body parts and in fact may even find the feeding process easier (due to a lack of protrusions) and then digest the food quicker as the skin is broken at several points. (Obviously limb culling is for already dead rodents, not while they are still alive).

In anticipation of having young snakes to raise, I cull rodents for limbs and tails routinely. This saves the expense of buying “pink” mice or rat-pups and reduces the overall food bill.

Fish feeding in Australian snakes and the use of rodent parts is covered by myself in another paper (Hoser, 2004) and so the detail is not repeated here. Another feeding technique used, and briefly mentioned is that of slashing or cutting food items such as skinks. This allows for more rapid digestion of food, again due to the added entry points of digestive juices. This allows for young snakes raised on skinks to be able to digest more food, more rapidly and hence grow faster. This is an important consideration if skinks are being used to raise snakes as their nutritional value is generally low. Without slashing or cutting skinks (already dead of course) and feeding more often, snakes raised on skinks tend to grow more slowly than their counterparts fed on other foods. (Dead and frozen skinks are used, not live, so as to remove as many parasites as possible before the snake eats the skink.)

Fish as a food source is good, rapidly digested and so on, but as already mentioned, is not a good staple for snakes. Rodents are generally the food of choice, but when one has a large collection of snakes and does not breed rodents, it is a constant struggle to buy feeder rodents (frozen) at a reasonable price.

By purchasing rodents in bulk at times of general surplus, it's possible to obtain rodent food for less money than it'd cost to breed them yourself in terms of food, and that's before labor is factored in; hence my practice of using frozen rodents as a primary food for my snakes.

With these factors in mind I experimented with alternative foods, such as meat, in order to determine:

- Whether or not snakes would eat it
- The nutritional value of such foods and whether or not they represented a cost-effective alternative to the more traditional foods used for Australian snakes.

Meat Feeding in Australian Snakes

I had heard anecdotal reports of captive tiger snakes (*Notechis scutatus*) feeding on strips of meat. Such reports were believable on the basis that tiger snakes are particularly voracious eaters in captivity and are known to strike and bite at unusual objects for food, including their keepers' hands. So-called “food bites” are the most common kind of bite that keepers get from their tiger snakes.

On the basis of the various unconfirmed reports of tiger snakes eating meat, I decided to see how far I could test the meat eating habits of snakes without adversely affecting their health. These feeding “experiments” as detailed in this paper occurred in 2003–2004.

Before going further, I should mention that at first the experiments were done on well adjusted captive snakes. Later when it became evident that not only was meat eating not harming the snakes, but actually of measurable benefit, the experimentation broadened to include newly captive reptiles and numerous species.

To begin with, I offered two subadult tiger snakes (one of each sex), strips of cooked silverside meat [editor's note: in the U.S. we call it top round of beef]. The meat was laced with vinegar and garlic. The first snake was offered silverside as a follow-on to a mouse it was eating. The snake finished the mouse and then ate the silverside. The second snake was offered a scented piece which was waved in front of the snake after a mouse was dangled in front of the snake. It struck at and ate the meat.

Subsequent to this (and during the same feeding session) one snake ate another (unscented) piece of silverside waved in front of it. The fact the other snake didn't eat this meat on second offer probably had as much to do with the fact it was no longer hungry rather than the properties of the meat itself. That theory was tested by offering the snake a mouse, and it too was refused.

Why silverside? Well, my wife had cooked up some for a dinner and we had some leftovers.

That the snakes ate the meat wasn't too startling a fact in hindsight, particularly as most keepers are aware that snakes are not high in the intelligence stakes and can be induced to eat all manner of objects (for examples refer to Hoser [1981, 1989, 2003c] and Stopford [1980]).

Of greater interest was the nutritional benefits of the food eaten. The high protein content of the meat and lack of bones, hair and so on, meant that the snakes put on exceptional condition in terms of the amount of meat eaten. In other words the meat had high food value. That the meat wasn't regurgitated also put it in good stead as a food source. Put another way, the digestive systems of the snakes had absolutely no trouble dealing with the protein intake. As to what the effects of a long-term high protein diet has on snakes are, that is largely speculative as no studies have been published on this.

It's been suggested that snakes that eat low protein food in the natural state, and then get exposed to a high protein diet in captivity may succumb to diseases unknown in the wild situation. This theory has been postulated as an explanation for difficulty breeding pythons of the genus *Aspidites* and granulomas that form within their lower intestines. I am far from convinced by this theory, but nevertheless I do accept that a high protein diet may not be good as a permanent feature of the diet of captive snakes.

Over the next three months, the same two tiger snakes were taken on a tour of the local supermarket freezer, being offered

all manner of meats that are sold over the shelf. Included were pork, salted ham, steak (lamb and beef), sausages, calamari rings (squid), prawns, chicken wings (plucked for human consumption), kangaroo meat, (and also road-killed possum meat fillets) and so on. All were eaten and digested without incident.

Similar feeding experiments were done on several other species of elapid, including death adders (*Acanthophis* spp.), copperheads (*Austrelaps superbus*), small-eyed snakes (*Rhinoplocephalus nigrescens*), eastern brown snakes (*Pseudonaja textilis*) and red-bellied black snakes (*Pseudechis porphyriacus*). All ate and digested meat as purchased from a butcher or a supermarket. The meat was usually served up to the snakes as filleted strips as a “follow-on” from rodent food.

In all cases the meat was digested without incident, except the two (exceptional) instances detailed shortly, and in all cases was credited with obvious gains in condition in the relevant snakes. Newly acquired, newborn and otherwise nonfeeding snakes (i.e., snakes that wouldn’t take any food voluntarily) were as a matter of course force-fed meat strips and all made rapid gains in condition.

Three newly acquired red-bellied black snakes (*Pseudechis porphyriacus*), had a host of ailments, including internal parasites and general emaciation. They were also carrying a reovirus (see Hoser [2003a, b]). The three snakes were force-fed strips of steak for their first three feeds (at weekly intervals) and all gained condition as much as could have been hoped under the circumstances. Other snakes from the same source, similarly affected, in other collections and not force-fed, died.

While it’s likely that rodent or fish based food items would have also enabled the said black snakes to gain condition, it is doubtful if the same degree of gains would have been seen in such a short period. Noticeable with the meat diet is that due to the high density of the food eaten, digestion time is slightly increased as compared to most food items of the same size and shape. However this is only of note in that a delay of an extra day or two between feeds is needed.

The only adverse case involving meats being fed to snakes was one of five snakes being force-fed some salted ham, cut into strips. The two smallest death adders regurgitated it within an hour of eating it. The three other snakes (including another slightly larger death adder) held it down and all gained condition as a result. (The two regurgitating death adders were force-fed rodent parts the next day and digested this without incident). Both snakes remain alive and well, many months later and also after further feeds of fish, rodent parts or small rodents and meat.

There is no doubt that the extreme saltiness of the ham is what precipitated the regurgitation in the two snakes least able to cope with salty food.

Similar regurgitation has also sometimes been seen in small snakes that are fed excessively salty marine fish (including whitebait), including snakes affected by the reovirus as documented by Hoser (2003a, b).

Notwithstanding the single adverse incident just given, meat

was shown to be useful and digestible by (what appears to include) most Australian species of snake.

From a cost-effectiveness view, chicken necks as sold for dogs (at about AUS \$2 a kilo) are the cheapest and most nutritious alternative to rodents for most larger snakes (1 m or over), being easily digested and providing high nutritional value.

In summary, meat in strips of basic kinds such as pork, beef and lamb can be used as a food source for most Australian elapids which will eat it without incident. The use of such alternatives may be useful during times when rodent availability is down.

Further Feedings of Note and Other Facts of Relevance

The eating and digestion of calamari by tiger snakes was expected, but is still very unusual. There are of course no previous records of the land-dwelling species feeding on deep sea squid, nor would any be expected.

A tiger snake also ate and digested a prawn without incident. Due to the high cost of prawns in shops, they would not generally be regarded as a food alternative for snakes and the case given here was merely the result of a test just to see if the snake would actually eat and digest the prawn.

However this does show that Australian snakes may in fact feed on food way outside that which they would encounter in the wild. In other words what snakes can eat in captivity should be dictated by their stomach’s ability to digest food and not necessarily what they encounter in the wild.

Death adders and copperheads also ate meat without incident, but generally as a follow-on from rodents. Red-bellied black snakes could be assist-fed meat strips. That is, the food was placed in their mouths and would then be eaten.

Tiger snakes were my first choice for experimental subjects. This was because I assumed (perhaps wrongly) that they would be the most likely snakes to eat almost anything on offer. To that end, they were offered strips of cooked meat, cooked fat and raw fat. And on one occasion two ate lamb riblets (sold as dog bones) that were dropped at the bottom of their cage. The two snakes both had trouble getting the hard and rectangular items down and after getting them down took about a week to digest the items sufficiently to stop the ends of the bone sticking out of the snake’s sides (as in showing up as squared ended spikes under the scales). Notwithstanding this, the bones were digested without incident.

Noting that no adverse affects from meat eating by snakes, and that several of several species in my care would eat such foods without inducement, I decided to test wild-caught snakes with such food items.

As a rule, it is illegal to catch and keep wild snakes, but as part of a capture/release permit, I sometimes found myself with snakes at my address for a short period. Among these were an evidently ill tiger snake that had eaten a ratsack-infected mouse [editor’s note: a ratsack is a poison bait containing warfarin], and an eastern brown snake that had injured itself on its head,

neck and midbody by getting caught up in netting.

Both were held for about five days until: a) the snakes were evidently healthy and b) I had time to drive to a suitable release location. To my surprise both snakes ate unscented meat strips when offered to them. These were both wild-caught snakes that had never been held in captivity, nor offered any other food such as rodents. As already stated, both were subsequently released as per license requirements.

Eastern brown snakes in particular seem to have a fancy for red meat (beef, lamb, etc.), even more so than tiger snakes and two in my care both ate unscented lumps of red meat that was simply thrown into their cages. I can only guess that this is so due to the known dietary preferences of the wild snakes. In the wild state, brown snakes prefer rodents, while tiger snakes prefer frogs and birds (although rodents also feature prominently in their diet).

To get an idea of why I suggest this, it's easy to pull the legs of a rodent free from the socket (shoulder or hip), leaving the skin and fur of the upper limb still attached to the body. The muscles (meat) thus exposed are similar in texture and color to red meat such as steaks. (Those familiar with eastern brown snakes will understand why I just opened the cage lid, threw in the food and shut the lid again).

A small-eyed snake (*Rhinoplocephalus nigrescens*) caught as a so-called "snake rescue" was assist-fed a strip of beef. It was digested without incident. The snake was then photographed and released. This species is typical of the small elapid snakes that account for the majority of Australia's serpent fauna. Their diet is generally thought of as small lizards and save for the occasional specimen that is "taught" to eat young rodents, they have until now been fed skinks by most keepers.

My experiments with small elapids have shown them to thrive on fish such as whitebait and comparable freshwater species. Meat strips can also be added to their dietary repertoire, although as with fish, they should (if used) only be a part of the snake's diet, not all.

Pythons (diamond and carpet, genus *Morelia*) were also offered whole steaks and parts thereof and all were eaten and digested without incident. In another series of feedings a carpet python ate cooked and raw sausages. The same snake also ate chicken wings as sold in a supermarket deli department.

Since 2004 at my facility, most larger snakes are fed a diet that dominates in chicken necks due to their high nutritional value, the eagerness with which the snakes eat them (as for mice in most cases) and the low cost.

The Feces

Another point of note is the sort of feces passed by snakes that eat lots of meat (such as beef, lamb, ham, etc). Unlike the rodent-based feces that typically have a white part (uric acid) and then a brownish black part consisting of the rest, including undigested fur and hair, meat-based feces are radically different. They tend to be a pasty white color throughout and well bound. I assume that this has something to do with the general lack of roughage and the high protein nature of the food eaten.

Conclusions

As no long term experiments or studies have been done on snakes kept exclusively on high-protein meat diets, I am not in position to detail the long term effects or to say whether or not such a diet is of positive or negative long-term benefit. However, several years in, snakes fed diets dominating in things like chicken necks have remained in good health and even bred (Hoser, 2007). Therefore, I can say that as a short-term proposition the use of high-protein meats appears to be beneficial as an alternative to the (usually) preferred food of rodents. High-protein meats are also substantially cheaper than rodents (per kilo or in terms of food value per dollar) and hence may form a useful adjunct to the dietary armory of a snake keeper, including when rodents are in short supply and/or if a keeper has a large number of snakes to feed.

Literature Cited

- Barnett, B. F. 1981. Observations of fish feeding in reptiles. *Herpetofauna* 13(1):11-13.
- Hoser, R. T. 1981. Note on an unsuitable food item taken by a Death Adder (*Acanthophis antarcticus*) (Shaw). *Herpetofauna* 13 (1):31.
- . 1989. Australian reptiles and frogs. Sydney, NSW, Australia: Pierson and Co.
- . 2003a. OPMV in Australian reptile collections. *Macarthur Herpetological Society Newsletter*, Issue 38:2-8.
- . 2003b. Reovirus — Successful treatment of small elapids. *Crocodilian* 4(3):23-27.
- . 2003c. Notes on feeding captive death adders (*Acanthophis antarcticus*), including posturing behaviour in response to large food items. *Herpetofauna* 33(1):16-17.
- . 2004. Feeding innovations for snakes. *Litteratura Serpentina* (March) 24(1):33-47.
- . 2007. Australia's Tiger Snakes. *Reptiles* March 2007, (also published on the internet at: <http://www.animalnetwork.com/reptiles/detail.aspx?aid=28279&cid=3702&search=>).
- Kortlang, S. 2001. An alternative food for reptiles — Fish. *Monitor — Journal of the Victorian Herpetological Society* 11(3):14-16.
- Stopford, J. 1980. Unusual food intake of a diamond python. *Herpetofauna* 12(1):35.

**Erratum: de Souza, R. C. G., Reproduction of the Atlantic Bushmaster
(*Lachesis muta rhombeata*) for the First Time in Captivity**

Rodrigo C. G. de Souza
Serra Grande Grande Center for *Lachesis muta* Breeding
Itacaré/Bahia
BRAZIL
lachesisbrasil@hotmail.com

Please note that in the above-mentioned article [Bull. Chicago Herp. Soc. 42(3):41-43] the paragraph at the center of column 2, page 42, incorrectly specified a total of 18 eggs resulting in 15 babies. The sentence should have read: “Out of 17 eggs (78–82 g each, 4 samples) from two different groups, one atresic egg was lost in the fourth day, two lost to flies in the 50th day and 14 babies (39–61 g, total length 43–49 cm) are doing fine.” The 14 eggs that successfully hatched are all visible in the accompanying photograph.



Bull. Chicago Herp. Soc. 42(4):66, 2007

The Tympanum

Greetings Mike:

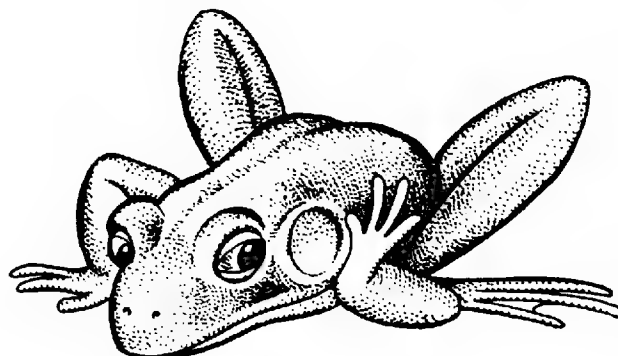
This is a hard letter to write — but one that must be written.

When I started writing for CHS, I wasn't even 30 years old. Now I'm over fifty — a long time has passed.

In that time, I have reported on all sorts of stories — the good, the bad and the horrible. I have seen species rescued from the brink of extinction and others pushed to the edge.

There really aren't any new stories. Snake eats man, man eats snake, snakes eat frogs and so on can only be written from a fresh perspective for so long before burnout flames into ennui.

I have reached that point. I've alphabetized my towels some



months before sitting down to write. “Avoidant” barely begins to cover it.

You know that. The columns have been fewer and harder to get out of me since August. And now, I'm done.

I can't write another word about News of Reptiles and Amphibians.

Thank you for a wonderful twenty-one years. I know someone will step up to the plate now that I'm not in the way anymore.

It's nothing you've done. It's all me.

Sincerely yours,

Ellin Beltz, Emeritus Columnist for the *Bulletin of the Chicago Herpetological Society*

What You Missed at the March CHS Meeting

by John Archer
j-archer@sbcglobal.net

The excuses start in the middle of the afternoon of the last Wednesday of most months. I'm too busy, too tired, the meeting's too late, and the traffic's too bad. But I said I'd bring those flyers, and I've got to return a cage to Jenny and talk to Steve and I really want to hear the speaker. So I find myself listening to the business report on the car radio explain to me why I should have sold those stocks in my retirement fund before the price dropped to the retail cost of two M&Ms as I inch my way through George Ryan's new improved "Hillside Strangler" on the Eisenhower expressway. Fortunately it's March, so when I finally arrive at the Nature Museum I don't have to drive up and down Canon Drive for twenty minutes looking for some jogger to vacate her parking spot after having just run twenty-five miles. And I remembered to bring my hand cart so I don't have to make multiple trips over the three miles that always seems to be between my car and the museum.

I suspect that more than one of you reading this has similar feelings about CHS meetings. I admit I'm spoiled. My job doesn't require me to sit in rush hour traffic twice a day. Nor does it require my hunting for a parking space in the city. It's often a hassle, and most of us don't need more hassle in our lives, but as I walk through the doors of the meeting room, I am always glad I made the effort. There's Mike, with his albino bull snake draped around his neck, selling drinks that he's nice enough to lug to each meeting, Jason towering over and entertaining a crowd with his witticisms, some cute kid I don't recognize proudly showing off his bearded, Linda trying to bring order out of chaos, and Marybeth handing out library books while wearing socks with embroidered cats (usually frogs). And then there are the speakers. I suppose it may seem as though I like the speakers no matter how mundane, but that's not true. I don't write about the mundane speakers simply because there are none. There's much vetting and searching and selecting that goes on behind the scenes so that when we do get speakers, they're good speakers. It's easy to write about good speakers.

By the time the meeting's over, I'm thinking that I would be only a little tired tomorrow morning at work if I went to dinner afterward, and it'll only take me forty minutes to get home at midnight. Next late afternoon of the last Wednesday of the month the excuses will start again, and I'll be glad I ignored them again. So if you're reading this so you won't have to fight the traffic, you're missing out. This column is for those of you who really can't get to a meeting: who live in California (although with the price of airlines tickets, I'm not sure that's a good reason. It's only once a month!), or have to stay home and watch your small kids (the larger ones you should bring), or whose car broke down (hitchhike). We all know that I can't convey the real fun of a meeting. Take advantage of

your CHS and come to the meetings. It's way more fun than reading about them.

So, one of the major pleasures of arriving at this month's meeting was seeing Jim Harding. I had the pleasure of meeting him once before, and he's a genuinely likable fellow. Jim is the wildlife information specialist at Michigan State University working jointly through the M.S.U. museum and the Department of Zoology. Since 1997 he's taught the undergraduate course "Biology of Amphibians and Reptiles" for M.S.U. Department of Zoology. He's written *Amphibians and Reptiles of the Great Lakes Region* (1997, University of Michigan Press) and three other books on the herps of Michigan. He also has a nice web site called "Wildlife and Natural History Q-Line" at <http://critterguy.museum.msu.edu>.

Jim talked about wood turtles (*Glyptemys insculpta*), a species he's been studying for over 40 years. Wood turtles are mostly a northern species, restricted to highlands toward the southern limits of their range. Most of Jim's studies are of two sites in Michigan. He showed pictures of the typical habitat, which was riverine with sand bars and grassy areas higher up the banks. Sympatric turtles include snapping (*Chelydra serpentina*), map (*Graptemys geographica*), and to a lesser extent, painted (*Chrysemys picta*) and spiny softshell (*Apalone spinifer*). He gave a brief taxonomic breakdown of emydid turtles, which convinced us that wood turtles are very closely related to Blanding's turtles. He has even bred hybrids of wood and Blanding's, albeit unintentionally when a well-meaning neighbor rescued a Blanding's by leaving it in Jim's wood turtle pen. A colleague of Jim's commented that the hybrids bore a striking resemblance to a twenty million year old fossil he had worked with. Emydids tend to be long lived, with box turtles known to live over 100 years and Blanding's producing eggs into their eighties or older. Gerontologists tend to be very interested in turtles because it's not obvious that they senesce. Indeed, the older the female, the more eggs she usually lays!

In 1993 a seminal paper was published with the catchy title of "Delayed Sexual maturity and Demographics of Blanding's Turtles (*Emydoidea blandingii*): Implications for Conservation and Management of Long-Lived Organisms."* Oddly enough, it didn't make the *New York Times* Best Seller List, but it's changing the attitude of a whole lot of wildlife biologists. Essentially the paper presented the data from long-term studies of a population of Blanding's turtles. The minimum reproduction ages of females ranged from 14 to 20 years. After the first year, turtle survival was extremely high, approaching 100% for adults. Survival of nests and hatchlings was abysmal. Wildlife managers and biologists normally operate with the assumption of a harvestable population, animals you can extract from a given population and still maintain that population. But this

* Congdon, J. D., A. E. Dunham and R. C. van Lohen Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): Implications for conservation and management of long-lived organisms. *Conserv. Biol.* 7(4):826-833.

study showed that for Blanding's turtles there was no sustainable harvest of juveniles or adults. The life history of long-lived animals includes low fecundity, low nest survival, delayed sexual maturity, high survivorship in juveniles, and very high (essentially one hundred percent) survivorship in adults. Turtles require a higher juvenile survivorship than any other vertebrate animals. That means that a single individual is extremely important for maintaining a population of turtles, and that any removal can have drastic effects on the sustainability of that population. Jim said that wildlife biologists' jaws drop when he speaks to them about this.

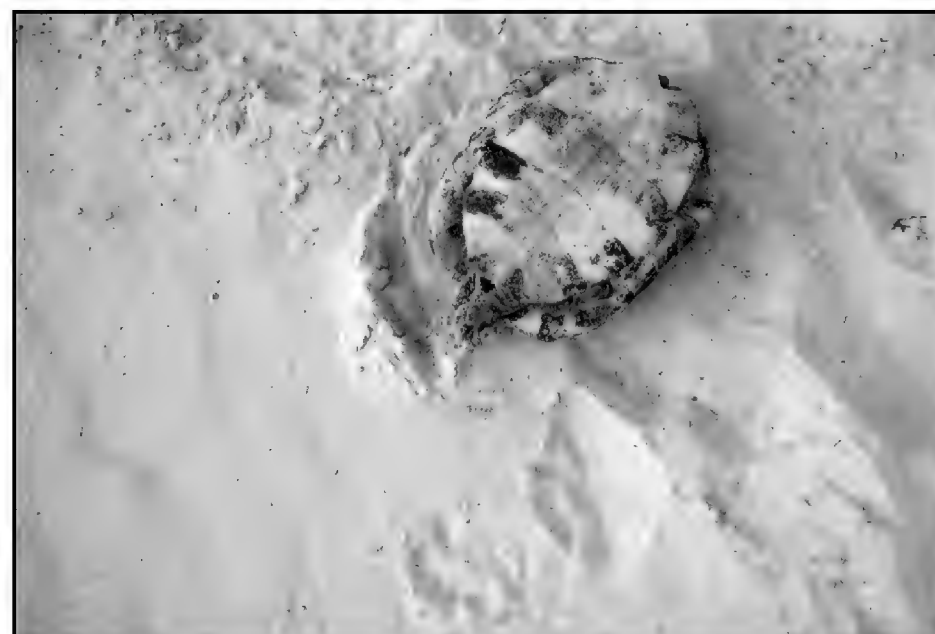
Jim then gave us a comparison between life histories of Blanding's and wood turtles. Both are Great Lakes area turtles, with Blanding's favoring slow water and the wood turtles preferring rivers. Blanding's are primarily aquatic feeders and wood turtles are primarily terrestrial. Blanding's have a partially hinged plastron and are not as popular in the pet trade. Threats are mainly incidental takes from snapping turtle traps and traffic mortality. Wood turtles were unfortunately lauded by many mid-century reptile writers as wonderful pets, and high commercial take is a serious threat even though wood turtles are legally protected over their entire range. While wood turtles seem to adapt fairly well to fragmentation of their riparian habitat, human encroachment has allowed what Jim calls "subsidized predators" to become the major threat to wood turtles' survival. Primarily raccoons, they consume all nests and hatchlings in areas where they become overabundant, and have recently been discovered preying on adults. Jim has not seen a wild-born juvenile turtle at one of his study sites for over a decade, and while he still finds a good number of adults, he thinks that his study site population is a ghost population: a population with enough adults that it seems to be doing well, but is not producing enough juveniles, if any, to sustain itself. So wood turtle populations are declining, and in many instances are being extirpated due to poachers, target practice by plinkers, road mortality and agriculture equipment in some areas, but mostly from raccoons. Jim believes that until raccoon populations can be decreased by either natural or artificial means, the wood turtles' survival is in real jeopardy, as well as that of every other turtle, because, even though all turtles are not as long-lived as emydids, they are all long-lived compared to other vertebrates and are subject to similar population dynamics. Jim doesn't advocate making it illegal for a ten-year-old to catch a baby painted turtle and take it home, and he does think that raccoons are cute, intelligent, furry little animals, but commercial harvesting of any wild turtle should be suspended and even cute, intelligent, furry little animals can cause huge devastation if not controlled. Jim delivers his message with the poise and demeanor of someone who has spoken to many groups, and I'm sure he'll speak to many more. Turtle populations around the world are under threat, and all of us need to spread that message. Jim probably does it better than we are able to, but we can help. Lastly, I don't want to stir the debate about wild-caught versus captive-bred animals as pets, but I know Jim's talk convinced me that there is no good reason to capture any other than a hatchling turtle from the wild, and for many turtle species, even that is unconscionable except to support an authorized head-start program.



Adult male wood turtle, *Glyptemys insculpta*, from Michigan.



Predated wood turtle nest.



Adult wood turtle killed by raccoon.

Herpetology 2007

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

FROG DEFORMITIES IN AGRICULTURAL HABITATS

H. Piha et al. [2006, Copeia 2006(4):810-817] note that recent studies suggest that the incidence of morphological abnormalities has increased in many amphibian populations, often exceeding the estimated background deformity frequency of 0–5%. Many chemical contaminants, including agrochemicals, can cause abnormalities in amphibians, but data on the occurrence of morphological abnormalities in wild amphibian populations in Europe is anecdotal at best. In a large-scale study covering 264 ha and 26 farmland breeding populations of the common frog (*Rana temporaria*) in southern Finland, the authors investigated whether the incidence of morphological abnormalities in metamorphs differed from the background level of 0–5% and among populations along an agrochemical gradient. Abnormalities occurred in a low frequency (1% of the studied individuals; 40/4115), the highest population-specific frequency being 4%. No evidence was found for increased abnormality frequencies in the habitats most likely exposed to agrochemicals. Hence, the data suggest that current Finnish agrochemical practices are not causing increased incidences of morphological abnormalities in *R. temporaria* populations breeding in farmland areas.

OVERWINTERING WOOD TURTLES

W. F. Greaves and J. D. Litzgus [2007, J. Herpetology 41(1): 32-40] note that seasonal variation in activity of reptiles is accompanied by physiological and behavioral adjustments that influence their ecology and life history, and overwinter survival may be an important factor limiting a species' northern range extension. A northern population of wood turtles (*Glyptemys insculpta*) in Ontario, Canada, was surveyed in fall 2004, and a subset of adults was radio-tracked every 7–12 days during the winter of 2004–2005 to examine thermal aspects of overwintering. It was predicted that wood turtles would use hibernacula that protect them from freezing and predation. Temperature data loggers indicated that turtle body temperatures and hibernacula temperatures remained near 0°C from 2 December 2004 until 3 April 2005. During the same period, air temperatures fluctuated substantially and reached a maximum of 10.5°C (on 30 March 2005) and a minimum of less than -40°C (on 21 January 2005) with a mean of -8.3°C. Turtles did not select specific water temperatures nor did they use distinct structures (e.g., root hollows, logjams or holes in the riverbank) for overwintering but instead rested relatively exposed on the riverbed at a depth of approximately 1 m and at a mean distance of 1.0 m from the riverbank. Surprisingly, turtles made small movements during winter (0.1–10.0 m between radio-locations), typically against the river current and in a direction parallel to the riverbank. Average winter home-range size was 7.1 m². These findings raise questions about why turtles move during winter; the authors suggest possible answers and future lines of investigation to address these questions.

FADED RATTLESNAKES

J. M. Parker and S. H. Anderson [2007, J. Herpetology 41(1): 41-51] conducted a three-year study to describe the ecology and behavior of the midget faded rattlesnake, *Crotalus oreganus concolor*. The authors encountered 426 and telemetered 50 *C. o. concolor* between 2000 and 2002. They found that their primary diet was lizards (associated with rock outcrops), though they will consume small mammals and birds. They den in aggregations, although in low numbers when compared to other subspecies. Movements and activity ranges were among the largest reported for rattlesnakes. Minimum convex polygon area was 117.8 ha for males, 63.9 ha for nongravid females, and 4.8 ha for gravid females. Mean distances traveled per year were 2122.0 m for males, 1956.0 m for nongravid females, and 296.7 m for gravid and postpartum females. Following emergence from hibernation, they spent several weeks shedding, often in aggregations before migration, and migrations occurred in early summer. Most snakes made straight-line movements to and from discrete summer activity ranges where short, multidirectional movements ensued, although others made multidirectional movements throughout the active season. Mating behavior was observed between 21 July and 12 August. Gravid females gave birth during the third week of August. Mean clutch size was 4.17 (range 2–7). The sex ratio was skewed favoring females 1:1.24, and they were sexually dimorphic in size (males SVL = 44.1 cm; females SVL = 40.8 cm). These data further illustrate the diversity within the large western rattlesnake (*Crotalus viridis*) complex.

FEEDING ECOLOGY OF A RATTLELESS RATTLESNAKE

H. Avila-Villegas et al. [2007, Copeia 2007(1):80-84] studied *Crotalus catalinensis*, a rattleless rattlesnake endemic to Santa Catalina Island, in the Gulf of California, Mexico. It has been hypothesized that the lack of a rattle in this species is a stealth adaptation for hunting birds in vegetation. The authors provide detailed data on the diet of *C. catalinensis* from samples obtained during nine trips to the island in 2002–2004. Over two-thirds (70%) of the diet of *C. catalinensis* was composed of the Santa Catalina deer mouse (*Peromyscus slevini*). The remaining prey were lizards (*Dipsosaurus catalinensis*, *Uta squamata*, and *Sceloporus lineatulus*). There was an ontogenetic shift in diet and higher feeding activity during the dry season. The diet of this species is only a small subset of the diet of its supposed closest relative, *C. ruber*, probably as a result of limited diversity of prey on the island. The lack of birds in the diet of *C. catalinensis* argues against the supposed importance of birds as an essential feature for the hypothesis relating the lack of a rattle with a stealth hunting technique for birds in vegetation. However, since *P. slevini* is partially arboreal, there remains the possibility that the lack of a rattle is an adaptation for stealth hunting for mice in vegetation.

AIRBORNE CUES AND POST-STRIKE TRAILING

M. R. Parker and K. V. Kardong [2006, *Herpetologica* 62(4): 349-356] note that rattlesnakes are highly adept at following substrate chemosensory trails left by struck (envenomated) prey. However, other sources of chemical information that may be present in the post-strike environment, such as odors from unstruck mice, could either confound or aid predatory success. Rattlesnakes can follow airborne chemosensory trails of a struck prey, but the ability of rattlesnakes to use airborne chemosensory cues of unstruck prey has not been examined. Therefore, the purpose of this study was to examine the abilities of rattlesnakes to locate prey using substrate and airborne cues from unstruck mice and compare this with their success with airborne odors from struck mice. Through a Plexiglas Y-maze, paired airborne and/or substrate odor choices were presented to northern Pacific rattlesnakes (*Crotalus oreganus*). In one treatment, snakes given a choice of odor from an unstruck mouse (substrate) versus a control (unscented air) showed a significant preference for the unstruck, substrate odor trail. In a second treatment, snakes given a choice of unstruck mouse odor (airborne) versus a control (unscented air) showed no significant preference for the airborne odor. In a third treatment, snakes given a choice of unstruck mouse (airborne) versus struck mouse odor (airborne) again showed no preference for either odor. This last result suggests that one cue used during airborne trailing is a general chemical cue and is most likely not associated with a distinct post-strike searching image (as is the case in substrate trailing). Snakes also exhibited certain behaviors within the maze (i.e., turning behavior, emergencies) more often when exposed to airborne cues than when exposed to substrate cues. These observations indicate that a different system of behaviors is used when rattlesnakes follow airborne compared to substrate odor cues during post-strike trailing.

MORPHOLOGY-BASED PHYLOGENY OF THE GENUS *CHIRONIUS*

J. L. Hollis [2006, *Herpetologica* 62(4):435-453] presents a phylogeny of the Latin American snake genus *Chironius* based on 36 external morphological and hemipenial characters. Data from the literature for the 20 recognized species of *Chironius* were combined with data collected from 20 outgroup taxa. The monophyly and in-group relationships of *Chironius* were assessed using both parsimony and other methods. Two optimal trees were obtained using parsimony criteria; the genus *Chironius* is supported as monophyletic with 93% bootstrap support from six unambiguous synapomorphies, including an even number of scale rows at midbody. A Bayesian analysis of the data supports the monophyly of *Chironius* with a posterior probability of 100%. Both analyses inferred similar topologies; recognized species groups are partially supported, but this analysis suggests that revision of the genus is necessary. The author proposes elevation to full species status of taxa within the *carinatus*, *fuscus*, *multiventris*, and *quadricarinatus* species groups on the basis of morphological features unique to each taxon. Future molecular work is necessary to resolve the remaining taxonomic issues within *Chironius*.

INDUCING MALE OFFSPRING IN LEOPARD GECKOS

D. E. Janes et al. [2007, *J. Herpetology* 41(1):9-15] note that estrogens and estrogen mimics can affect offspring sex ratios in a wide variety of animal species including leopard geckos, *Eublepharis macularius*, a species with temperature-dependent sex determination (TSD). Estrogens can disrupt effects of temperature on sex determination by feminizing or sex-reversing embryos incubated at male-producing temperatures. Estrogens may have paradoxical effects at different incubation temperatures and in different concentrations. In this study, *E. macularius* eggs were exposed to ethanol, estradiol benzoate, or estradiol 17 β at the beginning of the thermosensitive period when sex determination occurs. Eggs were treated and incubated at each of three incubation temperatures known to produce varying primary sex ratios. At a male-producing incubation temperature, estrogen-treated groups produced more females than negative control groups. This result has been reported in other TSD reptiles. This study also showed that at a female-producing incubation temperature, estrogen-treated groups produced significantly more males than negative control groups. This is the first report of its kind in which a TSD reptile was shown to produce significantly more males at a female-producing temperature. These results suggest a complex feedback relationship between aromatase and cofactors during the thermosensitive period of egg incubation in *E. macularius*. Expected effects of exogenous estrogens on contaminant-exposed wildlife populations may differ depending on nest-site temperatures.

FUTURE OF AMERICAN CROCODILES IN FLORIDA

F. J. Mazzotti et al. [2007, *J. Herpetology* 41(1):122-132] note that when the American crocodile (*Crocodylus acutus*) was declared endangered in 1975, scant data were available for making management decisions. Results of intensive studies conducted during the late 1970s and early 1980s by the National Park Service, Florida Game and Fresh Water Fish Commission, and Florida Power and Light Company resulted in an optimistic outlook for crocodiles. However, new issues face crocodiles today. Florida and Biscayne Bays have undergone changes that have caused concern for the health of these ecosystems. This paper reviews results of monitoring programs for *C. acutus* that have been used as a basis for consideration of reclassification of this endangered species and for restoration of its endangered ecosystem. More crocodiles and nests occur in more places today than in 1975. The maximum number of nesting females in Florida has increased from 20 in 1975 to 85 in 2004, and the number of concentrations of nesting effort from two to four. This evidence supports the proposed reclassification of the American crocodile from endangered to threatened. However, crocodiles are still threatened by modification of habitat because of development adjacent to crocodile habitat and will benefit from restored freshwater flow into estuaries. As crocodiles continue to increase in number and expand into new areas, interactions with humans will occur more frequently. The challenge of integrating a recovering population of the American crocodile with an ever-increasing use of coastal areas by humans will be the final challenge in successful recovery of this once critically endangered species.

Unofficial Minutes of the CHS Board Meeting, March 16, 2007

Linda Malawy called the meeting to order at 7:52 P.M. Board members Kira Geselowitz and Erik Williams were absent.

Officers' Reports

Recording Secretary: In Kira's absence, Rich Crowley read the minutes of the February 16 board meeting, which were accepted with no changes

Treasurer: Andy Malawy discussed the financial statements for February and reported that our liability insurance bill has come due and will be paid in time for ReptileFest.

Membership Secretary: Mike Dloogatch reported that membership has risen slightly. There was a brief discussion about the new membership flyer. For the time being, an additional 2,000 of the old flyer will be printed.

Vice-president: Steve Sullivan reported that high-quality speakers have been found for each month of the year. Details need to be confirmed for a few still. April's speaker will be Dr. Carl Gerhardt from the University of Missouri-Columbia, presenting "Vocal Communication in Frogs."

Corresponding Secretary: Cindy Rampacek reported that the CHS answering machine had received many calls and that she was able to take care of all of the callers.

Sergeant-at-arms: Jason Hood reported at least 49 people at the February 28 meeting.

Committee Reports

Shows: Within the past month we have had booths at the DuPage and Lake County animal shows, the Kids Expo, the Chicagoland Pet Show, and the Notebaert. These were all productive venues. We are thankful for the opportunity to be involved with these shows and very thankful to everyone who has volunteered their time to work at the booths and educate the public. Linda and Steve were able to appear on the NBC morning show with a variety of snakes and lizards to promote the Pet Show and ReptileFest. Later that evening they were interviewed for a segment of Steve Dale's Pet Central Show on WGN and also recorded a short spot for syndication. Steve was interviewed for an article in the Pioneer Press papers to run that same weekend.

ReptileFest: Jenny Vollman reported that online registration for exhibitors is working. Deb Krohn and John Archer will be sending flyers to nonprofits and others who request them. The contract for the venue has been signed, insurance submitted, and catering set. All costs including the venue and exhibitor lunches have increased slightly.

Discussion on venomous snakes at ReptileFest was re-initiated after having been tabled last month. Many plausible arguments for and against inclusion of venomous snakes were brought up. After considerable discussion, Cindy made a motion to allow Rob Carmichael and the staff of the Wildlife Discovery Center to exhibit one individual of each of the four venomous snakes native to Illinois alongside the other native herps of Illinois.

Jenny seconded the motion. After additional discussion, the motion was passed with Mike Dloogatch voting in opposition and no abstentions.

Monthly Raffle: Josh Chernoff thanked everyone who has brought items for the raffle. The donation of quality products and big-ticket items makes our raffle attractive and profitable.

Library: Steve Sullivan reported regular usage of the library and requested anyone who has overdue books out to return them.

General Meetings: We will continue to have short presentations in addition to the main program. Thanks were expressed for Deb's well prepared and presented short (in the form of a Jeopardy game) at the February meeting.

Grants: Mike Dloogatch reported the receipt of one thank-you so far from grant recipients.

Chicago Wilderness: Steve will convey our positions as CW's "No Child Left Indoors" program develops and will participate in some upcoming forums.

Old Business

Calendar: Board meetings will be held at member's homes to cut costs and make them more interesting. As always, board meetings will be open to all members. Please contact a board member for the latest meeting location. A request was made for people to bring amphibians to Salamander Safari. Jason is coordinating a Kentucky zoo trip for late summer.

A motion was made and passed unanimously to renew our liability and board of directors insurance coverages.

Round Table

- Deb reported that spring peepers began calling at Plum Creek Nature Center on Wednesday, March 14.

The meeting was adjourned at 10:12 P.M.

Submitted by Steve Sullivan



**THE
GOURMET
RODENT,
INC.™**



RATS AND MICE

Bill & Marcia Brant
6115 SW 137th Avenue
Archer, FL 32618
(352) 495-9024
FAX (352) 495-9781
e-mail: GrmtRodent@aol.com

© All Rights Reserved

Advertisements

Feeder Roaches: *Blaptica dubia*, all sizes, meaty and nutritious. Free samples to CHS members, or buy a starter colony to make your own. Superior to crickets in every way. This non-flying, slow moving, non-climbing species is very easy to breed and easy for your reptiles to catch. One starter colony of 100+ mixed sizes, \$25. If you don't know about roaches as feeders, read up on them; you'll never need to deal with the hassles of crickets again. E-mail: aasagan@msn.com

For sale: rats and mice — pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. We feed our colony a nutritionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice starting from: pinks, \$.17 each; fuzzies, \$.24 each; hoppers, \$.30 each; weanling, \$.42; adult, \$.48. Rats: starting with pinks at \$.45 each, to XL at \$1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. PO Box 85, Alpine TX 79831. Call **toll-free** at (800) 720-0076 or visit our website: < <http://www.themousefactory.com> > .

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice available: small newborn pinks up to jumbo adults. Prices start at \$25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: herp books. *The Snakes of Arizona* by Jack Fowlie, 1965, 164 pp., b&w photos of each sp. and subsp., range maps, signed by author, \$40; *Reptiles of Australia* by Charles Barrett, 1950, 168 pp., many b&w photos, no DJ, \$80; *The Reptiles* by Archie Carr, 1977, 192 pp., many color and b&w photos, well done book by this noted herpetologist and writer, \$9; *The British Amphibians and Reptiles* by Malcolm Smith, 1973, 322 pp., 91 figs., 16 b&w plates, very detailed, DJ, \$25; *Natural History of Snakes* by H. W. Parker, 1965, 95 pp., 18 figs., 6 b&w plates, an authoritative review; softbound, \$8; *Boy's Book of Snakes* by Percy Morris, 1948, 185 pp., many b&w photos, some minor ink marks, \$15. All books hardbound and in excellent condition unless otherwise indicated. \$2.50 postage and handling for orders under \$25, free for orders \$25 or more. E-mail for complete list. William R. Turner, 7395 S. Downing Circle W., Centennial CO 80122; phone (303) 795-5128; e-mail: toursbyturner@aol.com.

For sale: Now taking reservations for rare/unusual gartersnakes & watersnakes. Expecting offspring in June: **Easterns** — leucistic \$450, het leucistics \$250-300/pair, albinos \$250-275, melanistics \$35-50, snow \$395, flames \$100, erythristic \$100, erythristic × albino \$150, silver — inquire, axanthic \$50, granite \$150, Florida \$25 each/2 for \$40. **Plains** — axanthic \$75, albinos \$75, anerythristic \$40, snow (Nebraska/Iowa strains) \$95, normals \$25 each/2 for \$40. **Red-sided** — albino \$375, hets \$350/pair, poss. hets \$75-95, double het snow \$295/pair, colorless × anerythristic — inquire, anerythristic \$75, normals \$25 each/2 for \$40. **Eastern blacknecks** \$95. **Wandering** melanistic \$95. **California red-sideds** — normals \$125, het hypomelanistic — inquire, **Puget Sound** \$40, **Santa Cruz** \$60, **Mesoamerican Highlands** \$40, Florida blue striped (similis) \$40. **Watersnakes** — banded albino \$450, high red × albino \$225 pair, het hypomelanistic Florida watersnake — inquire. Scott Felzer, (919) 365-6120 Eastern Time, email: sfelzersgarters@bellsouth.net. Web address is www.albinogartersnake.com

Herp tours: Adventure trips to **Madagascar!** Journey somewhere truly unique to seek and photograph nature on the world's least-studied mini-continent. For maximum herp fun and discovery, join Bill Love as we go where few people will ever venture in their lives. Let his experience assure a comfortable tour finding the most colorful and bizarre species on the planet! Get all the details at Blue Chameleon Ventures' comprehensive new website: < <http://www.bluechameleon.org> > , E-mail: bill@bluechameleon.org, or call (239) 728-2390.

Herp tours: The beautiful Amazon! Costa Rica from Atlantic to Pacific! Esquinas Rainforest Lodge, the Osa Peninsula, Santa Rosa National Park, and a host of other great places to find herps and relax. Remember, you get what you pay for, so go with the best! GreenTracks, Inc. offers the finest from wildlife tours to adventure travel, led by internationally acclaimed herpers and naturalists. Visit our website < <http://www.greentracks.com> > or call (800) 892-1035, E-mail: info@greentracks.com

Virtual Museum of Natural History at www.curator.org: Free quality information on animals — emphasis on herps — plus expedition reports, book reviews and links to solid information. Always open, always free.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: MADadder0@aol.com

REPTILE WEARABLES

Colorful original reptile designs on quality T-shirts in adult, youth, toddler and infant sizes.

Tie-dyes and Ladies' style tees, too.

Secure online ordering or call:

216-529-0811

Wholesale orders welcome.

email: leostudio@mac.com



VISA - MC - DISCOVER

www.reptilewear.com

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, April 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The program will feature **Dr. Carl Gerhardt** of the University of Missouri, Columbia, speaking on "Vocal Communication in Frogs."

Chris Lechowicz, former CHS president now residing in Fort Myers, Florida, will speak at the May 30 meeting about his recent trip to Madagascar.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum — the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held May 18. For information as to where the meeting will be held and directions, call Mike Dloogatch at (773) 588-0728.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

THE ADVENTURES OF SPOT



Periodicals Postage
Paid at Chicago IL

CHICAGO HERPETOLOGICAL SOCIETY

Affiliated with the Chicago Academy of Sciences

2430 North Cannon Drive • Chicago, Illinois 60614
